

**WHAT IS CLAIMED IS:**

1. A wind turbine comprising:
  - (a) a rotor;
  - 5 (b) a generator;
  - (c) a low-speed positive displacement hydraulic motor driven by the rotor to act as a hydraulic pump;
  - (d) a variable displacement hydraulic transmission which is connected to and drives the generator as a motor;
  - 10 (e) a closed loop hydraulic oil circuit for carrying pressurized oil to the transmission from the motor and to return oil to the motor from the pump; and
  - (f) means for varying the displacement of the transmission in response to variations in pressure within the oil circuit.
2. The system of claim 1 wherein the hydraulic motor is driven at the same rotational  
15 speed as the rotor.
3. The system of claim 1 wherein the rotor comprises a horizontal axis wind turbine rotor and wherein the hydraulic motor, hydraulic transmission, closed loop oil circuit and generator are tower mounted.
4. The system of claim 1 wherein the displacement variation means comprises a  
20 hydromechanical system comprising a pressure compensating valve operatively connected by means of servo control oil to a mechanical actuator.
5. The system of claim 1 further comprising a hot oil shuttle.
6. The system of claim 1 further comprising:

(a) brake means for stopping the rotor, which brake is biased towards contact with the rotor shaft and which is released by oil pressure; and

(b) means for pumping oil to develop brake release oil pressure.

7. The system of claim 1 wherein the generator is an asynchronous induction generator.

5 8. The system of claim 1 wherein the generator is a synchronous generator.

9. The system of claim 1 wherein the rotor comprises a vertical axis wind turbine rotor.

10. A method of generating electricity from wind power using a tower-mounted rotor, and a generator, comprising the steps of:

10 (a) directly coupling a low-speed, high torque hydraulic motor to the rotor, such that the motor may act as a pump, turning at a rotational speed of less than 100 rpm when driven by the rotor;

(b) operatively connecting a variable displacement hydraulic transmission to the hydraulic motor by a closed hydraulic circuit such that the transmission acts as a motor;

15 (c) coupling the transmission to a generator, driving the generator at speed effective to produce electricity.

11. The method of claim 10 wherein the displacement of the displacement of the hydraulic transmission is varied in response to variations in the pressure generated by the hydraulic motor acting as a pump.

20 12. The method of claim 10 further comprising a startup step of connecting the generator to a power grid such that the generator becomes an electric motor, thereby driving the transmission, the motor, and the rotor until the rotor becomes wind-driven.

13. The method of claim 10 further comprising the step of exchanging heated oil for cooler oil, during wind-driven operation, in a hot oil shuttle which forms part of the closed hydraulic circuit.

5 14. A wind turbine tower comprising a rotor, a generator and a closed loop hydraulic power transmission system comprising:

- (a) a low-speed positive displacement hydraulic motor which is driven by the rotor without speed increasing gears;
- 10 (b) a variable displacement hydraulic transmission which is connected to and drives the generator and which includes means for varying the displacement of the transmission in response to changes in pressure in the hydraulic system;
- (c) a closed loop oil circuit for carrying pressurized oil to the pump from the motor and to return oil to the motor from the pump;
- (d) wherein the rotor-driven motor and transmission operate under an overrunning load condition to drive the generator; and wherein
- 15 (e) the generator and closed loop hydraulic power transmission system are tower mounted above ground.